



Kadi Sarva Vishwavidyalaya
Faculty of Engineering & Technology
 Electronics and communication Engineering
 (Academic Year 2019-20)

Subject Code: EC502-N	Subject Title: MICROCONTROLLER AND INTERFACING
Pre-requisite	

Course Objective:

The educational objectives of this course are

- To understand the basics and evolution of microcontroller.
- To study about the functional components of AVR in detail.
- To study about the Assembly & C language programming.
- To study the various types of instructions provided by AVR and Addressing Modes.
- To study about timer, counter, serial and interrupt programming.
- To study concepts of interfacing of LCD, ADC, DAC, sensor, keypad, external memory, RTC, relay, PWM, DC and stepper programming in C & Assembly Language.

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
03	00	02	05	04	03	70	30	20	30	150

Outline Of the Course:

Sr. No.	Title of the Unit	Hours
1.	Introduction to AVR Microcontroller	03
2.	AVR Architecture and Assembly Language Programming	10
3.	AVR Assembly Language Programming:	10
4.	AVR Programming in C	12
5.	AVR Peripherals Interfacing	13
		48

Total hours (Theory): 48

Total hours (Lab): 16*02=32

Total hours: 80



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Detailed Syllabus :

Sr. No	Topics	Lecture Hours	Weight age(%)
1.	Introduction to AVR Microcontroller: Microcontroller and Embedded Processor, Overview of AVR Family	03	05
2.	AVR Architecture and its Programming: AVR Microcontroller architecture, General Purpose Registers in AVR, Data Memory, AVR status register, ROM space and other hardware modules, RISC Architecture in AVR, ATmega32 pin configuration & function of each pin.	10	20
3.	AVR Assembly Language Programming: Addressing modes of AVR, Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions. AVR data types and assembler directives, AVR assembly language programs, AVR I/O Port Programming, Time delay loop, BCD, ASCII conversion Program, Look-up table, Bit addressability, MACROS.	10	15
4.	AVR Programming in C: Data types, I/O programming, logic operations, Data conversation programs, data serialization, Intel HEX file, Timer programming in assembly and C, Interrupt programming in assembly and C, Serial Port programming in assembly and C.	12	25
5.	AVR Peripherals Interfacing: LCD and Keyboard Interfacing, ADC, DAC and sensor interfacing, Relay, Opto-isolator and Stepper Motor Interfacing, Input capture and Wave Generator, PWM programming and DC motor control, SPI protocol and Display interfacing, I2C Protocol and RTC interfacing	13	35
	Total	48	100

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.



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Learning Outcome:

At the end of this course, the student would be able

- The student can learn about detailed aspects about AVR Microcontrollers & its programming, I/O Port Programming AVR Programming in C and interfacing of external devices. A Serial and Parallel Port communication.

TEXT BOOKS:

1. AVR Microcontroller and Embedded Systems Using Assembly and C, Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education

REFERENCE BOOKS:

1. Programming and Customizing the AVR Microcontroller, Dhananjay Gadre, McGraw Hill Education

List of Experiments (Not limited to following. Subject teacher may modify the same):

No.	List of Experiment
1.	Introduction about AVR simulator.
2.	Write a program to add content of two register R20 and R21 and Store result in memory location 0x120 locations. Show status of the C, H and Z flags after addition of 0x9C and 0x64.
3.	Write a Program to subtract two Sixteen bit numbers.
4.	Write a Program to Find Smallest/Largest Numbers from given numbers.
5.	Write a Program to find number of 1's in a given byte.
6.	Write a Program to toggle the I/O register of PORT B Continuously
7.	Write a Program to perform the followings a) Keep monitoring the PB2 bit until it become high. b) When PB2 becomes high, write the value 45H to port C and send high to low pulse to PD3
8.	Write a Program to generate Square wave of 16 KHz on Pin PortB.3. Assume Crystal Frequency is 8 MHz.
9.	Write a Program to perform the followings a) Keep monitoring the PB2 bit until it become high. b) When PB2 becomes high, write the value 45H to port C and send high to low pulse to PD3
10.	Write a Program to transfer letter 'A' Serially using 9600 Baud rate. Assume Crystal Frequency is 8 MHz.
11.	Installation of Arduino software and write program for blinking LED.
12.	Read Push-button switch and display its status on LED.
13.	Interfacing 7-Segment LED Display with AVR Board.
14.	Interfacing of 16x2 LCD with Arduino board and display message on it.
15.	Interface 4x4 matrix keyboard with AVR microcontroller. Display value of pressed switch on LCD.
16.	Interface Temperature LM35 Sensor display temp its equivalent digital value on LCD.
17.	Interface Stepper motor with AVR Microcontroller and Write program to rotate stepper motor in clockwise and anticlockwise direction.
18.	Interface DC Motor with AVR Microcontroller and write program to rotate DC motor in clockwise and anticlockwise direction.